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Sources of Economic Fluctuations in East Asia from 1980 to 2006
—————Analysis Based on Panel VAR

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Abstract: The synchronization of the economic fluctuations in East Asia has been confirmed academically. This paper quantifies the impact of six different shocks, using a panel vector auto-regression approach and determines their contributions to macroeconomic volatility in East Asian economies. In general, the impacts of supply shock, exchange rate shock, external demand shock, and world interest rate are the main sources of fluctuations. Exchange rate is the main transmit channel of external shocks, while the inflation rate mainly transmits the domestic shocks. With the deepening of the regional integration and financial openness in East Asia, the economies should pay more attention to the shocks caused by the variation of external demand shock, and world interest rate.

Keywords: Economic fluctuations; East Asia; Panel VAR; Impulse response; Variance decomposition

1. Introduction

Since 1980s, East Asia has been concerned by the whole world for its average 6% growth rate. However, East Asia has also experienced some volatility during this process. The volatility in this period is different from the classical economic fluctuation characterized by the expansion and contraction of the output absolute quantity, but belongs to the modern economic volatility which is embodied by the variation of the growth rate. Even for this, the volatility is deemed to have negative effect on the welfare. The negative volatility-growth link has been documented broadly, Ramey and Ramey's seminal paper (1995), Fatás (2002), Acemoglu and others (2003), Hnatkovska and Laoyza (2005), making volatility a fundamental development concern. These studies show that volatility's indirect welfare cost through reduced economic growth is magnified in countries that are poor, financially and institutionally underdeveloped, or unable to conduct countercyclical fiscal policies.

As to the reasons of the volatility, people are declined to analyze from both external and internal sides recently. Among policymakers, external shocks, such as terms-of-trade fluctuations, international conditions, are often explicitly or implicitly blamed for this volatile performance. Recently reports by the IMF, World Bank, and UNCTAD state that "exogenous shock...can have a significant negative impact on developing countries' growth, macroeconomic stability, debt sustainability and poverty". With the weak financial systems, East Asian countries would receive more exogenous shocks than other countries, in the form of "sudden stops" of capital inflows, for

instance. However, internal shocks resulting from social conflicts, political instability, and economic mismanagement are also a potentially important source of economic volatility.

Using panel data, Hoffmaister and Roldos (1997) conclude that domestic country-specific aggregate supply shocks are by far the most important source of output fluctuations in the Asian and Latin American countries, which seems to contradict the stylized facts documented by Agenor, McDermott, and Prasad (2000), that's because the latter doesn't allow for an explicit foreign output shock. Ahmed(2003) studies the sources of economic fluctuations in key Latin American countries, and concludes that dollarization is not a desirable choice for these countries. Claudio(2007) quantifies the impact of different internal and external shocks using a panel vector auto-regression approach and determines their contributions to output volatility in low-income countries. He finds that the external shocks can only explain a small fraction of the output variance of a typical low-income country. However, the internal shocks only include output and aid in his paper. Some other studies have also empirically distinguished between external and domestic shocks for developing countries, e.g. Fackler and Rogers (1995), Reinhart (1995), Edwards and Vegh (1997), and Montiel (1997). However, typically these studies focus either on only one or two countries, or on a very limited number of shocks and variables.

The rapid growth of East Asia has been paid much attention recently, but the researches of its volatility from the overall perspective are still very limited. Basing on the data from 1980 to 2006, this paper quantifies the impact of external and internal shocks using a panel vector auto-regression approach and determines their contributions to macroeconomic volatility in the 9 East Asian economies. The sample includes China, Japan, Korea, HongKong and 5 countries of ASEAN. The reason for choosing these economies is for their important roles on East Asia. Section 2 discusses the main stylized facts about the incidence of external shocks in East Asia economies. Section 3 explains the methodological approach and discusses its main assumptions. Section 4 presents the results of the empirical analysis. Section 5 reports on the robustness of the analysis. Section 6 concludes and gives further extension.

2. Stylized facts on external and internal shocks in East Asia countries

Some summary statistics for some domestic variables and external shocks in the 9 economies of the sample are shown in Table 1. The same statistics for the United States is also provided for comparison. The volatility of output and prices is twice larger in East Asia than in the United States, except China and India. Apart from Hong Kong and Philippine, the economies in the sample has undergone some degrees of inflation. In contrast to the improvement in the United States, the terms-of-trade in East Asia is worsening in a more unstable way. Given the relative importance of primary commodities in the export of these economies, the decline in commodity prices and their larger volatility may be especially relevant: the income elasticity of demand for manufactured goods is greater than that for primary products, then as incomes rise the demand for manufactured goods would increase more than the demand for primary products. That's the deteriorating trade terms theory proposed by Raul Prebisch and Hans Singer.

Table 1 Sample of countries included in the analysis and summary statistics

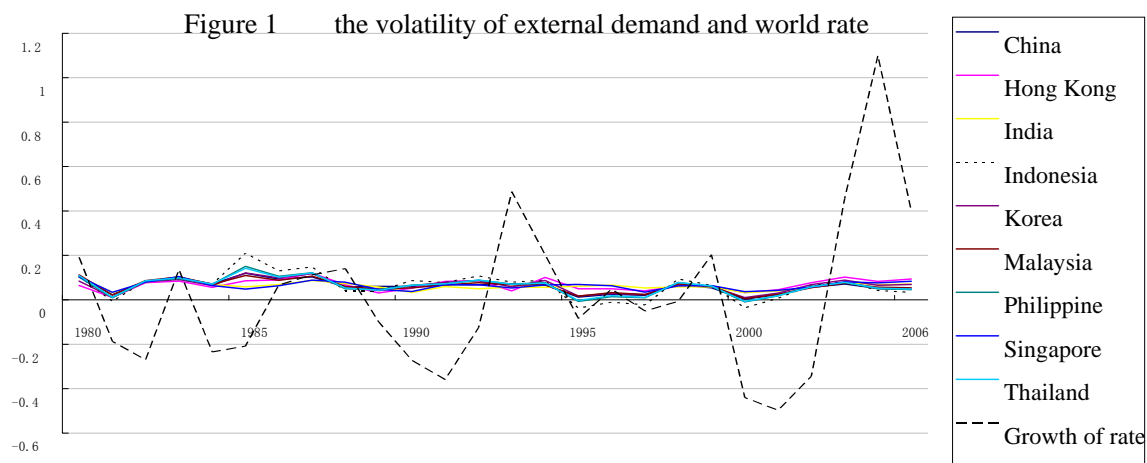
Country	Sample period	Average real GDP growth	Standard deviation of real GDP growth	Average growth Price level	Standard deviation growth Price level	Average growth of terms-of-trade index	Standard deviation growth terms-of-trade index
China	1980-2006	0.119	0.029	0.006	1.172	-0.012	0.057
Hong Kong	1980-2006	0.067	0.047	-0.175	0.945	-0.001	0.017
India	1980-2006	0.071	0.025	0.046	0.38	0.021	0.114
Indonesia	1980-2006	0.063	0.048	0.349	1.723	-0.014	0.146
Korea	1980-2006	0.090	0.041	0.064	0.587	-0.016	0.047
Malaysia	1980-2006	0.067	0.046	0.33	1.609	0.015	0.072
Philippine	1980-2006	0.037	0.04	-0.051	2.696	-0.002	0.097
Singapore	1980-2006	0.077	0.043	1.887	10.944	-0.015	0.019
Thailand	1980-2006	0.078	0.051	0.268	1	-0.011	0.051
United States	1980-2006	0.051	0.021	0.0006	0.34	0.002	0.028

Notes: The data of terms-of-trade in 2006 India and 1980 Indonesia is missing. The real GDP is adjusted by PPP. The terms-of-trade is the ratio of export index and import index, basing on the level of 2000.

With the deepening of trade liberalization, as the export-oriented economies, the East Asia countries depend on the export markets more severely. In 2006, export income represents about 30-60% of the East Asia countries' GDP, while it's as much as 68% in Malaysia. So the change of the outputs in export markets will affect the volatility of the economies greatly. Moreover, the developing economies tend to be heavily indebted and dependent on foreign capital for their less developed domestic capital markets, so they are potentially vulnerable to changes in international credit conditions. Changes in international interest rates may affect significantly the borrowing conditions faced by the developing countries. The variables we use to capture these potential sources of external shocks are the external demand measured as the export-weighted (using weights from 2006 data) aggregate of the real GDP of the five largest export markets and international interest rate measured as the six-month LIBOR in US dollars. As shown in the figure, though the main export markets are different¹, their demands have the same business cycles. That's because their major export goods are primary ones, the volatility of the demand is similar among countries. Moreover, the world interest rate is much more unstable than the external

¹ The main export markets of China are the United States, Hong Kong, Japan, Korea and Germany; For Hong Kong: China, the United States, Japan, the United Kingdom and Germany; For India: the United States, Arab countries, China, Singapore and the United Kingdom; For Indonesia: Japan, the United States, Singapore, China and Korea; For Korea: China, the United States, Japan, Hong Kong and Germany; For Malaysia: the United States, Singapore, Japan, China, and Thailand; For Philippine: the United States, Japan, Netherlands, China, and Hong Kong; For Singapore: Malaysia, the United States, Hong Kong, China, and Indonesia; For Thailand: the United States, Japan, China, Singapore, and Hong Kong;

demands, especially after 2000. In fact, the volatility of the world interest rate reflects the change of the monetary policy in the United States. Since the burst of the economic foam in the internet field in 2000, the Federal Reserve has decreased the interest rate to stimulate the economy, which caused large foam in the real estate market. Since the June of 2004, the Federal Reserve increased the interest rate 17 times to decrease the inflation pressure. This process is reflected in the volatility of the interest rate.



3. Empirical Model, Methodology, and Data

Model

The empirical methodology is to estimate a six-variable vector autoregression (VAR) model using annual data from the 9 economies of East Asia over the period 1980-2006 in a panel setting. To every country i , we estimate the following dynamic, structural system of equations:

$$A_0 x_{i,t} = \alpha_i + \beta_i t + \sum_{j=1}^p A_j x_{i,t-j} + u_{i,t}$$

where $x_{i,t} = \begin{pmatrix} z_{i,t}' \\ y_{i,t}' \end{pmatrix}$, $z_{i,t}' = (\Delta yf_{i,t}, \Delta tot_{i,t}, usr_t)$ is a vector of exogenous variables

including foreign demand growth Δyf , the rate of change of the terms of trade Δtot , and the

U.S. real interest rate usr ²; $y_{i,t}' = (\Delta rer_{i,t}, \Delta y_{i,t}, \pi_{i,t})$ is a vector of endogenous variables, including the rate of depreciation of the exchange rate Δrer , domestic output growth Δy , and domestic inflation π computed as the rate of change of consumer prices. The

vector $u_{i,t} = (\varepsilon_{i,t}, \eta_{i,t})'$, $\varepsilon_{i,t}$ represents the vector of external shocks (the terms of trade, foreign

² The U.S. interest rate variable, usr , does not have an i subscript, as it does not vary across countries.

output, and U.S. real interest rate shocks, respectively); and the vector $\eta_{i,t}$ represents the vector of domestic shocks (a domestic real exchange rate shock, a domestic output shock, and a domestic price level shock, respectively).

There are six variables in the model, so we need 36 assumptions to identify the equations:

(1) Following the studies of VAR model, we assume that the structural shocks are orthogonal and have unit variance, i.e. $Var(V_t) = \Omega$. This gives us $(n(n+1)/2) = 21$ restrictions. (2) The

small open economy assumption: each country in the sample is only the price-receiver, and can't affect the world price. Specifically, the terms-of-trade faced by the countries, the GDP of export countries, the world interest rate are not affected by the present or past economic performance of any particular East-Asia country, but all these variables probably have a contemporaneous and lagged effect on this performance, that is

$a_{14} = a_{15} = a_{16} = a_{24} = a_{25} = a_{26} = a_{34} = a_{35} = a_{36} = 0$. All the economies in the sample are

NIEs, so this assumption makes sense. (3) The recursive causal ordering about various shocks: ①

For the external variables, causality runs from terms-of-trade faced to foreign output to the U.S. interest rate. We put the terms-of-trade and foreign output before the U.S. real interest rate to allow for the possibility that U.S. monetary policy may react to these variables within the year. Putting U.S. interest rate last in the causal ordering of the three external variables also implies, however, that foreign output, which includes U.S. output, does not react to U.S. monetary policy contemporaneously, $a_{13} = a_{23} = 0$. As pointed out by Ahmed(2003), this identification assumption

is standard in studies of U.S. monetary policy employing monthly or quarterly data, but may be overly strong for annual data. ② Placing terms-of-trade after the GDP of export markets assumes that changes in the demand for commodities translate into changes in the relative price of these products contemporaneously, but fluctuations in commodity prices affect export markets' output only with a lag, $a_{12} = 0$. As pointed by Claudio(2007), this assumption is also common in VAR

studies of U.S. monetary policy that control for the price puzzle by including indexes of commodity prices (see, for example, Christiano et al., 1998). ③ For the internal variables, it would seem difficult to determine the direction of causality between the real exchange rate and output. Certainly, changes in exchange rate policy, which could be one source of domestically driven shocks to the real exchange rate, can affect output. But economic theory also predicts that changes in output related to changes in domestic productivity relative to foreign productivity affect the real exchange rate as well. Since this latter effect is more a longer run phenomenon in most open-economy models, it seems reasonable to put the real exchange rate ahead of output in the contemporaneous causal ordering, $a_{45} = 0$. ④ We also assume that the domestic price level

affects the exchange rate and domestic output only with a lag, $a_{46} = a_{56} = 0$. These 36

assumptions together can just identify the equation, which implies a lower-triangular A_j matrix:

$$A_j = A(L) = \{a_{ij}\} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 & 0 \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & 1 \end{bmatrix}$$

Methodology

The identification restrictions mentioned above are used to retrieve the structural dynamic system given by from the reduced-form estimated VAR, which is estimated by ordinary least squares. However, in dynamic panels with fixed effects, the OLS estimates of the coefficients on the once-lagged dependent variables are biased. The usual practice to correct for this bias is to use second lags as instruments for the once-lagged dependent variables (see, Hsiao, 1986), and estimate with the GMM method.

The model corresponds to a panel VAR in which it is assumed that the dynamics, represented by the A matrices, are common across cross-sectional units. This is a standard assumption in this literature (see Broda, 2001, 2004; Ahmed, 2003; Uribe and Yue, 2004) because, given the length of the time series dimension of the data (around 26 annual observations), it is not possible to estimate country-specific dynamics unless we reduce importantly the number of exogenous shocks under consideration, the number of lags, or both. However, as noticed by Pesaran and Smith (1995), this assumption may lead to obtaining coefficients that underestimate (overestimate) the short-run (long-run) impact of exogenous variables if the dynamics differ importantly across countries. Our sample includes 9 developing economies in East Asia, and they are alike in the degree of development, economic structures, the development of financial system and the surrounding circumstances. Moreover, they are all NIEs, having the common characteristics of NIEs, like small market size, high growth and high returns. So the heterogeneity of the parameters is relatively small, and the assumptions make sense.

Data

For each country, domestic output is real GDP based on purchasing-power-parity (PPP) per capita, with the Current international dollar; the domestic price level is the percent change of the consumer price index (CPI); foreign output is an export-weighted (using weights from 1999 data) aggregate of the real GDP of the five largest export markets; the exchange rate is indirect quotation, with an increase indicating a real appreciation of the domestic currency; and the terms of trade are the ratio of export to import prices (taken from import and export unit values); the U.S. interest rate is Six-month London interbank offered rate (LIBOR). The data of terms-of-trade is taken from the World Bank, the exchange rate is from the International Monetary Fund, and others are from the World Economic Outlook Database, 2008 updated.

4. Results

To implement the VAR, all variables must be in stationary forms. In the presence of non-stationary variables, a related problem is the possibility of finding spurious regressions. It is widely recognized that standard tests have very low power in front of the panel data (see Enders, 1995). This has led to the development of tests that exploit the panel dimension of the data and are, therefore, more powerful.

Table 2 Unit root tests

Variable	Levin-Lin-Chu test		Im-Pesaran-Shin test	
	statistics	<i>P</i> -value	statistics	<i>P</i> -value
Growth of real GDP per capita	-6.23153	0.0000	-5.943	0.000
Growth of term-of-trade	-6.10051	0.0000	-8.758	0.000
CPI	-6.29401	0.0000	-7.659	0.000
Growth of external demand	-5.07768	0.0000	-6.022	0.000
Growth of exchange rate	-5.59252	0.0000	-6.504	0.000
Variable	Z(t)	1% critical value	<i>P</i> -value	Obs
Log interest rate	-5.142	-4.380	0.0001	25

The results of unit root tests of table 2 significantly rejects the null hypothesis that the series follows a unit root process, and the results indicate that all the variables can be characterized as stationary process. We first estimate the model with GMM, then obtain the impulse response and variance decompositions from Monte Carlo simulations with 500 replications.

Output

Output growth fluctuations in East Asia economies are explained almost by domestic shocks, with external shocks explaining a small fraction of these fluctuations (see Table 3). Amongst domestic shocks, supply shocks are the main source of output growth fluctuations, explaining roughly 90 percent of the total in the short, and 53 percent in the long-run. This shock not only includes the changes of the components of the real output, also the changes of the relative weights of the components; exchange rate shock appears more important in the long-run, explaining one-third of the output fluctuation. The regression results in Table 3 also support the significance of these two shocks. The role of price shock is much smaller, and not significant. The three external shocks totally explain 14 percent of the output fluctuation in the long run, which is a little bigger than 10 percent in Hoffmaister and Roldos(1997). That's because there' external demand in our model, which can significantly explain 13 percent alone, which means this factor can't be ignored. Moreover, the other two external shocks, terms of trade and interest rate only have a minor role, which can only explain less than 1 percent of the output fluctuation even in the long-run insignificantly.

Table 3 The results of panel VAR estimation

dependent variables	Independent variables					
	External demand(t-1)	Terms of trade(t-1)	rate(t-1)	Exchange rate(t-1)	gdp(t-1)	cpi(t-1)
External demand(t)	0.432 (0.0712) ***	0.0116 (0.039)	0.0056 (0.004)	-0.045 (0.014) ***	-0.116 (0.064)	0.0008 (0.0005)
Terms of trade(t)	0.118 (0.197)	0.037 (0.089)	0.0155 (0.0098)	-0.1349 (0.0544) ***	0.144 (0.147)	0.0013 (0.0019)
rate(t)	3.756 (0.573) ***	0.028 (0.23)	0.808 (0.0296) ***	-0.003 (0.1411)	-0.1334 (0.565)	0.0028 (0.0038)
Exchange rate(t)	-0.817 (0.3769)***	-0.0869 (0.11)	0.0611 (0.0165)***	-0.0736 (0.12799)	0.86 (0.2975)***	0.002 (0.002)
gdp(t)	0.189 (0.065) ***	0.0006 (0.024)	0.005 (0.004)	-0.17 (0.026) ***	0.389 (0.067)***	0.0007 (0.0007)
cpi(t)	-1.779 (12.875)	3.395 (3.648)	-0.066 (0.498)	18.52 (8.44) ***	27.98 (12.47) ***	0.32 (0.097) ***

note: six variable VAR model is estimated by GMM, country-time and fixed effects are removed prior to estimation. Reported numbers show the coefficients of regressing the row variables on lags of the column variables. standard errors are in parentheses, ***indicates significance at 1% level

The dynamics of adjustment of output in the East Asia economies have the expected sign and confirm the relative importance of the different shocks (see Figure 2). A favorable supply shock leads to output expansion, but it couldn't last long and decrease to the original level very soon. It means that large inputs without structural reforms can't lead to the continuous economic growth.

Figure 2 also shows that one standard deviation shock to the external demand results in an almost continuous and statistically significant increase in GDP. It indicates that outputs in East Asian economies are highly sensitive to fluctuations in the world business cycle. The response of output to the world interest rate shock implies that tighter monetary conditions in the United States diminish capital flows to the East Asian countries, thereby leading to a contraction of their outputs.

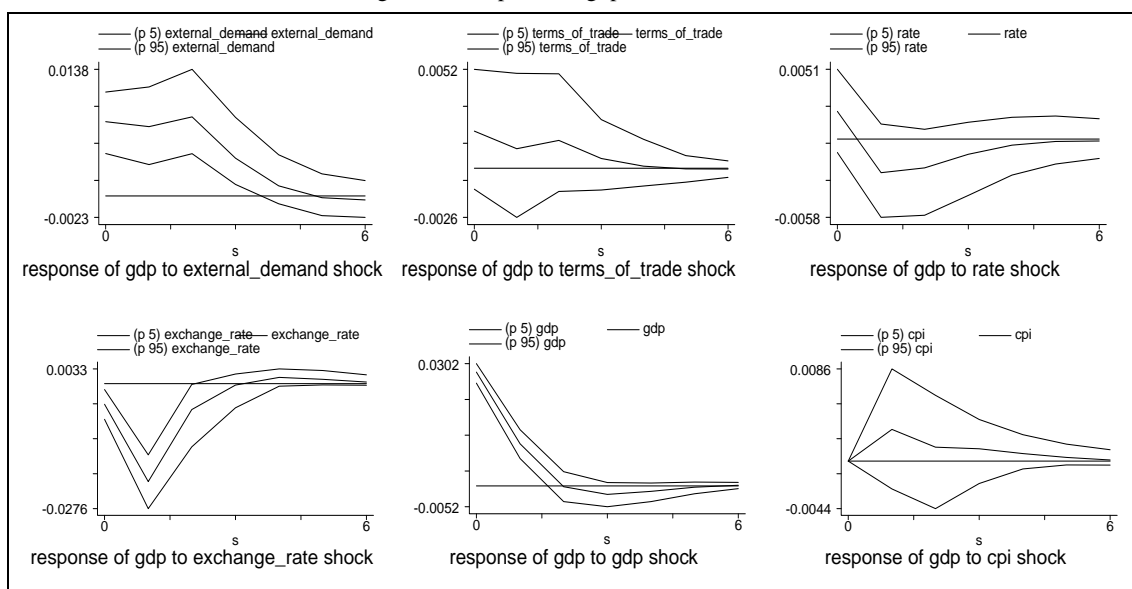
Contrary to the economic theory, the depreciation of currency leads to the decrease of the output, which is the same as Ahmed(2002). This implies that devaluations tend to be concretionary, at least in the short run, even after controlling for the effects of the three external shocks. There is no "devaluations effect". Theoretically, depreciation could simulate the economic growth by increasing the export production, but if there's no capability to expand the production, it will hurt the economy in the end.

Table 4 Variance Decomposition

K (years)	Variance Decomposition of output growth(%)							
	External shocks			Domestic shocks			All External shocks	All Domestic shocks
	External demand	Terms of trade	U.S. interest rate	Exchange rate	Domestic output	Domestic price		
1	7.4	0.42	0.47	2.33	89.38	0	8.29	91.71
5	12.79	0.43	0.97	31.22	53.87	0.73	14.19	85.81
10	12.80	0.43	0.97	31.25	53.82	0.73	14.2	85.8
Variance Decomposition of the rate of change of the exchange rate (%)								
1	0.49	0.03	5.53	93.95	0	0	6.05	93.95
5	3.29	0.17	7.54	84.71	3.72	0.56	11.01	88.99
10	4.05	0.17	7.99	83.46	3.7	0.62	12.21	87.78
Variance Decomposition of the rate of inflation (%)								
1	0.14	0.25	2.55	5.64	2.92	88.51	2.94	97.06
5	1.52	0.29	4.68	22.04	5.91	65.56	6.49	93.51
10	2.24	0.3	4.87	21.81	5.86	64.9	7.41	92.59

Notes: The contribution of all external and domestic shocks may not sum exactly to 100 percent due to rounding.

Figure 2 Response of gdp to various shocks



Notes: errors are 5% on each side generated by Monte-Carlo with 500 reps

Exchange rate

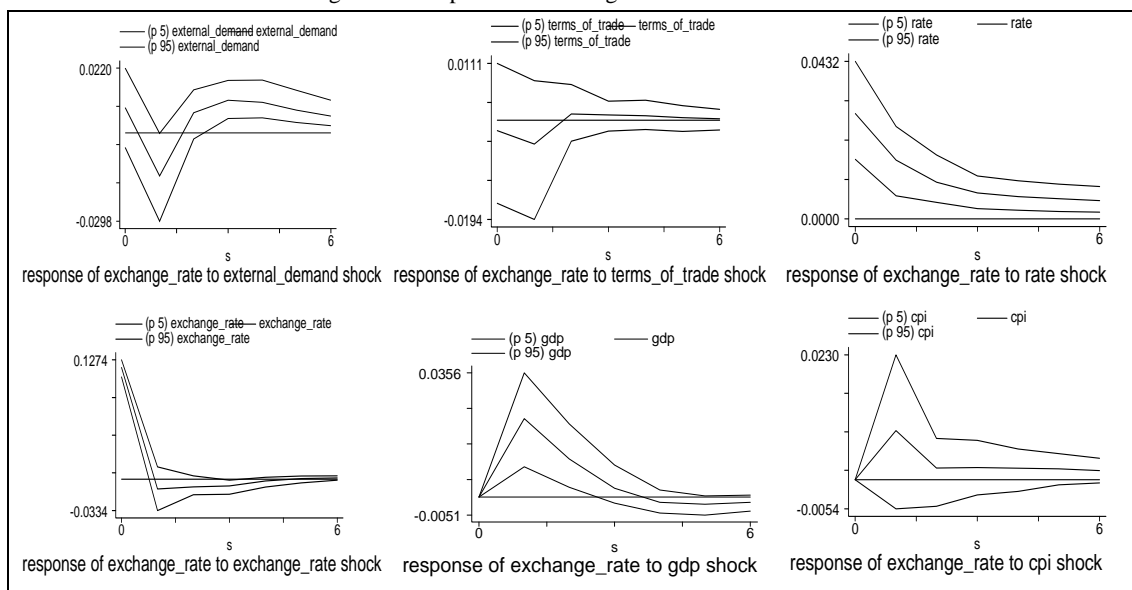
Exchange rate fluctuations in the East Asian economies are also mostly due to domestic shocks, with external shocks explaining only a small fraction of its fluctuations (see Table 4 Figure 3). Amongst the domestic shocks, the shock from exchange rate itself can explain nearly 84 percent

of its fluctuations in the long-run and somewhat more in the short-run. In the long-run, the supply shock can significantly explain less than 4 percent of the exchange rate fluctuations. The price shock has a very small and insignificant explanatory role. By including the external demand, the external shocks can explain a little more than the 10 percent in Hoffmaister and Roldos(1997). While amongst the external shocks, both the external demand and the world interest rate are more important than the terms-of-trade.

Theoretically, the supply and demand of the currency can determine the exchange rate, which is supported by the impulse-response function in Figure 3. Favorable external demand shock, increasing demand for domestic goods, leads to the appreciation of the currency. Tighter monetary conditions in the United States diminish capital flows to the East Asian countries, thereby leading to a depreciation of their currencies. The favorable supply shock leads to the depreciation of the currency, which is different from the common sense, but its role is relative small.

To be emphasized, the sample period covers a mix of exchange rate regimes. A discrete exchange rate regime may be inherently a different type of change than smaller, more frequent depreciations in floating rate periods. In failed fixed exchange rate regime, devaluation shocks are often accompanied by domestic austerity measures, capital outflows, and crisis situations, like the case in 1997 of East Asia. In the collapse of a fixed change rate regime, it is still difficult to ascertain which of the past shocks led to an accumulation of pressures on the currency which actually made the fluctuations.

Figure 3 Response of exchange rate to various shocks



Notes: errors are 5% on each side generated by Monte-Carlo with 500 reps

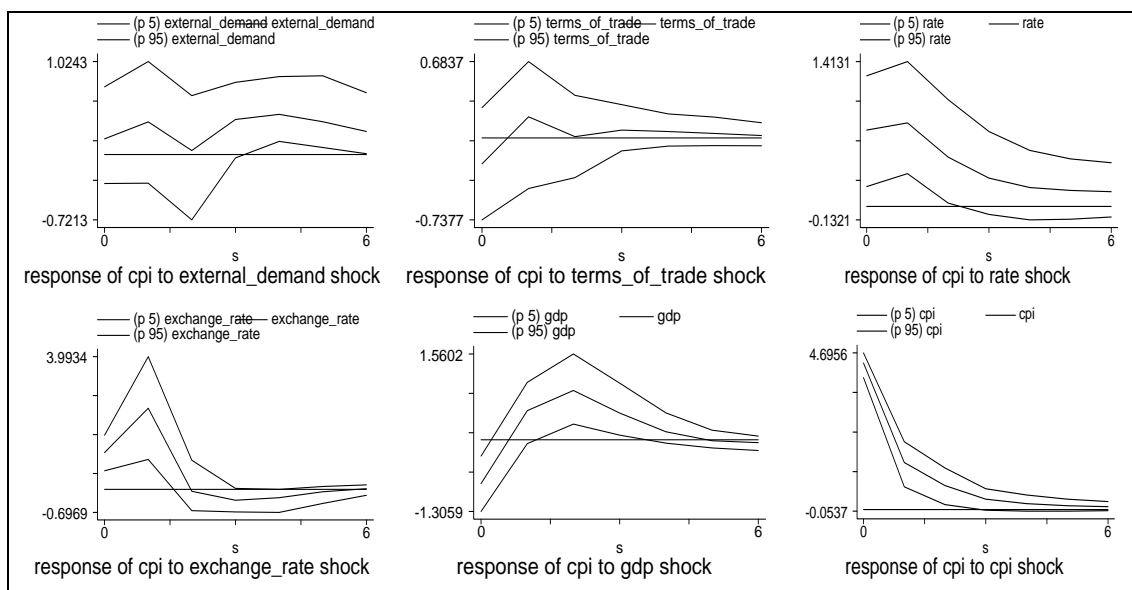
Inflation

Both in the short-run and the long-run, more than 92 percent of inflation movements in the East Asian economies are significantly explained by domestic shocks (see Table 3). The empirical evidence suggests that exchange rate shock can explain more than one-fifth of the inflation fluctuations in the long run, which can be seen from Figure 4. Positive shock of the exchange rate, depreciation, leads to an increase of the inflation rate. The economies in the sample are all developing ones, the depreciation of the currency suppress the imports and fosters the

development of the industries for import substitution, then push the inflation. The supply shock also leads to the inflation, in short-run, the potential output of a country is fixed, and the balance of the actual output and potential output determines the direction and degree of the change of the price. The economies in the sample are all NIEs, with the characteristics of high growth, so the effect of the supply on the inflation is as high as 27.98 in the regression result. Moreover, the inflation is self-fulfilling, with the shock from itself explaining more than 64 percent of the fluctuation in inflation, and much severer in the short-run. This phenomenon is widespread in the Cost-push inflation, as well as the case when the price increases alternatively among the industries.

Theoretically, the increase of the external demand will lead to the surplus of the current account, which will lead to the increase of the currency in circulation and push the inflation. But the empirical evidence shows the external demand shock has a small impact on prices. The change of the monetary conditions in the United States can explain five percent of the fluctuation in inflation, which is supported by the facts: the Federal Reserve decreased the interest rate to stimulate the economy after 2000, which leads to the expansion of its domestic demand and increase of the East Asian export. The growth of the export production increased the inflation pressure of East Asian economies.

Figure 4 Response of exchange rate to various shocks



Notes: errors are 5% on each side generated by Monte-Carlo with 500 reps

5. Robustness

The results reported in the previous section were obtained under a series of assumptions regarding the recursive ordering of the variables within block containing the external variables. It is important to show that our results are robust to other plausible orderings of the external variables. In this regard, it is instructive to study the correlation properties of the shocks in the reduced-form VAR to see which ordering changes might have the potential to affect our results and conclusions significantly; if two reduced-form shocks have very little to no correlation with

each other, we already know the results would be affected very little by changing their ordering. The correlation matrix of the reduced-form shocks is presented in Table 5. First, note that the correlation of each of the three external shocks is the lowest, in the range of 0 to 0.15 in absolute value. Second, each of the three external shocks with each of the three domestic shocks is in the range of 0 to 0.27 in absolute value, the biggest among them is the correlation of domestic output and external demand. We measure the external demand by the export-weighted aggregate of the real GDP of the five largest export markets, most of which are inside the Asian countries. Totally, the correlation is not much high, and this provides some confidence that the block recursive assumptions under which the external-variables block is causally prior to the domestic block, which follow from our small open economy set-up, are plausible. Third, within the domestic block, the correlation between the exchange rate and the domestic price is relative high as 0.27, while the other two pairs of shocks have roughly low correlation. These correlation coefficients suggest that an alternative model in which the causal ordering of the exchange rate and the domestic price variables is reversed is the relevant ones to consider in examining robustness.

The results from the estimation of this alternative model are very similar to our benchmark results, only with some differences in the variance decompositions. The contribution of price shocks to every variable rises, while the contribution of the exchange rate shocks to every variable decreases. But the results of regression and the impulse response don't change, and the direction and significance don't change either.

Table 5 Correlation matrix of the reduced form VAR residuals

	External demand	Terms of trade	Rate	Exchange rate	gdp	cpi
External demand	1.0000					
Terms of trade	-0.109(0.11)	1.0000				
rate	0.147 (0.03)	0.006(0.93)	1.0000			
Exchange rate	0.068(0.32)	-0.026(0.71)	0.25(0.0002)	1.0000		
gdp	0.27(0.0001)	0.035 (0.61)	0.11(0.12)	-0.12(0.09)	1.0000	
cpi	0.036(0.59)	-0.055(0.43)	0.16(0.02)	0.27(0.0001)	-0.181(0.008)	1.0000

Notes: Standard errors in parentheses.

6. Conclusion

Recently, there has been renewed interest with respect to emerging-market countries in the age-old question of the macroeconomic fluctuation for the frequent crises in these countries. This paper quantified the absolute and relative importance of a broad set of external and internal shocks for output fluctuations in the East Asian emerging economies. Based on the empirical results of this study, we can conclude:

First, the output instability experienced by these economies is largely the result of internal factors. A favorable supply shock leads to the increase of domestic output, but the effect can last after 2 periods. It means that large inputs without structural reforms can't lead to the continuous economic growth. The shock of exchange rate explains one-third of the output fluctuations, but

there is no “devaluations effect”, which means that devaluation isn’t an effective way to stimulate the economy. Moreover, given the high dependence of East Asia on the export trade, the role of external demand shock is important in the output fluctuations. Favorable external demand shock leads to the increase of domestic output.

Second, positive external demand shock leads to the appreciation of the currency, while the high world interest rate will diminish capital flows into sample economies and lead to the depreciation of the currency.

Third, the self-fulfilling of the inflation is the main source of its fluctuations, which is much more evident in the case of Cost-push inflation. The exchange rate shock can explain one-fifth of the price fluctuations. The depreciation sustains the import and fosters the development of the industries for import substitution, which will push the inflation ultimately. The emerging markets should pay special attention to the issue of high growth with high inflation, which means that favorable supply shock will lead to the inflation.

From a policy perspective, our results suggest that the emphasis on external shocks as a source of economic instability in East Asian economies is probably misplaced. We have shown that the role played by external shocks as a whole is not more than 15 percent in each variable fluctuation. Of course, this does not imply that exogenous shocks should be completely disregarded. We have shown that the external demand and world exchange rate shocks play a significant role respectively. The large role played by internal factors implies that exogenous contingencies may have limited power to smooth output fluctuations. To a large extent, output fluctuations are not determined by factors that countries cannot control without large changes in their productive structures.

The research in this study is just preliminary, while future research can pay specific attention to the various domestic shocks, like political instability, economic mismanagement, and imperfect financial institutions. Furthermore, combining the external with internal shocks can allow for the interaction of each other.

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